Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.6, No.2, 2016

# Problematic *Melia volkensii* Seeds Packaged and Ready to Germinate by Farmers

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**Abstract**

*Melia volkensii* is a useful multipurpose tree grown in semi-arid to arid lands. Products from the tree are highly regarded and expensive. The species has a problem with germination although it seeds profusely. A break through by Kenya Forestry Research Institute (KEFRI) in germinating Melia Volkensii seed was a milestone in history of Forestry especially in Arid and semi-arid lands. Techniques developed, require good sanitary and high temperatures condition and seeds pre-treated when wet to get 50% *Melia Volkensii* seed germination in green house or laboratory. It is impossible to germinate the seeds on farm. New methods of germination of Melia volkensii seeds have been developed. Method is composed of miniature greenhouse carrying ten dry pre-treated, fumigated seeds together with satirized sand and water. Farmers are asked to trigger germination by allowing water to mix with sand and seed and place the sachet in worm armpit temperature. Several sachets were made and given to 25 farmers in Kitui (Kabati, Chuluni, Kyanguthia) ready to germinate. Results indicate an overall 56.70% of farmers achieved germination. When $\chi 2$ test was applied at $p<0.05$, there were no significant difference in germinations. Showing that, all farmers had similar number of seeds germinating. By use of this method germination is possible by any farmer an indication of success of the new method of germinating *Melia volkensii*. It also shows that germination can be achieved up to 60% (achieved by one farmer from Kyanguthia) depending on position temperature maintained. This method then requires refining to achieve better results.

**Keywords** *Melia volkensii* Seeds, miniature greenhouse, dry pre-treatment, germination

## 1. Introduction

The tree *Melia volkensii* is highly prized for it very diverse products which included high quality timber which is comparable to camphor (*Octea usambarensis*) or mahogany (*Swietenia macrophylla*) wood and its durability compared to cedar. The growth rate in Asal is 0.90m as Mean annual increment in height (MAI height) and Mean annual increment of diameter at breast height (MAI dbh) is 1.19cm as reported by Muturi et al (2000). The stem is cylindrical and merchandise bole length (for timber) depends on height suckers removed for purposes of hindering branches growth. *Melia volkensii* is very good agroforestry specie compatible with most cereals. The tree has a rotation of ten to twelve years. The tree with all that desirable features to forester and farmers in arid lands, do have a serious problem of propagation although it seeds profusely every year. The germination of *Melia volkensii* is very complicated operation that requires experts and high septic measures which cannot be done by laymen. This study was to look into simplified ways that a farmer could easily germinate *Melia volkensii* seeds

## 2. Objective of the new ways of germinating *Melia volkensii*

The overall objective is to develop a simplified method of germination of *Melia volkensii* seeds by farmers in semi aid regions with a certified seeds from KEFRI.

**Other objectives**

a. Test Dry pre-treatment of *Melia volkensii* seeds

b. Avail packed seeds of *Melia volkensii* to farmers,

c. Set septic standard conditions for making it possible to germinate *Melia volkensii* seeds,

d. Increase chances growing *Melia volkensii* tree in ASALs

## 3. Problem statement

A break through by Kenya Forestry Research Institute (KEFRI) in germinating *Melia Volkensii* seed was a milestone in history of forestry especially in Arid and semi-arid lands (Milimo, 1989). The techniques developed, require good sanitary and high temperatures condition and seeds pre-treated when wet to get 50% *Melia Volkensii* seed germination. This can only be achieved in greenhouse situation or laboratory. The method need to be simplified and farmer friendly (Kamondo, et al 2005). This requires preventing fungi growth while achieving high temperature required by the specie on farm conditions. Currently pre-treatment of *Melia volkensii* seeds, is done when wet hence cannot be stored especially on transit to famers. The seed dry pre-treatment should be done carefully by experts with septic condition. This should enable medium/short term storage while on transit to farmers as end users.

## 4. Literature review importance of this project

Method developed by Kenya Forestry Research Institute is complex thereby farmers are unable to germinate the seed of *Melia volkensii* as reported by Teel Wayne (Dr) (2004). Many farmers have repeatedly said they cannot germinate seeds of *Melia Volkensii* even if they know the procedure. Roelandlelieveld (2011) is a good example is who says “I face the same problem with Melia volkensii. “They are so difficult to produce even when you know how it works.” Says a Blog website of A Kyuso Maarifa Center where farmers have aired they urgent need to germinate *Melia volkensii* they even try using presumed method like burning of seed coat etc. So this project is mainly born from the dire needs of germination of this highly prized tree by farmers.

## 5. Methodology

*Melia volkensii* Seeds nuts of high quality from KEFRI were availed enough to produce required number of seeds for experiment. The seeds were extracted using a *Melia volkensii* nut cracker (Lugadiru 2004). The damaged seeds were removed. Autoclaved sand put in the main sachet together with dry pre-treated ten seeds, sterilized water (being 10% of the sand by weight) enclosed in a water-tight smaller sachet put together in main bigger sachet then sealed.

The sachets were made from polythene (gauge 20) sheet which was cut to desired size and sealed using polythene paper sealer. Two sizes were made one to contain sterilized water and bigger one to contain everything (seed, sand and water sachet).

Sand was autoclaved for ten minutes then cooled weighed ten grams for each sachet. Water was distilled and measured 0.01 liters and placed in a smaller sachet sealed and put in the main sachet.

**Figure 4 *Melia volkensii* seeds packed ready for storage**

The seeds were removed from nuts using a nut cracker and then sorted to achieve a good seed grade. The selected ten good seeds were pre-treated when dry and placed in main sachet then sealed.

Many sachets were made and taken to farmers who had been pre-selected for the experiment by Kitui staff. The only qualification was desire to plant *Melia volkensii* which is known as 'Mukao' in Kikamba (one of Kenya tribes). The farmers were chosen from Chuluni, Kabati and Kyagwithia divisions. Each area had ten farmers selected at random and gender consideration put in place.

**Figure 5 dry seed pre-treatments**

The distribution was done in one day and farmers asked to place it in worm environment after triggering the germination. Farmers were trained at respective home on few basic requirements like temperature and triggering the sachet for germination. The expected date of germination was given to farmers. Seed of pre-treated seeds of *Melia volkensii* germinate after four to seven days. If germination were noticed, what to do next was explained. The sachet should be slit open and transplant the seedling into a polythene bag containing brown soil and irrigated once in a week.

Method of triggering germination was briefly described and placed on the sachet outside in a Swahili language.

## 6. Data analysis

There were three blocks in the experiment and each block contained varying number of farmers. Each farmer was used as a sample plot. One block had three famers participating; two others blocks had ten farmers participating. The data analysis began with comparing percentages between blocks of farmers. Results were also analyzed by use of $\chi^2$ test to see the significance of number of seeds germinated and those not, achieved by all the farmers in the experiment.

## 7. Results

After a week (May 16th) a monitoring exercise was conducted, tables 3 in the appendix are results for each farmer involved in the experiment. Total germination percentage of seeds is calculated as done by FAO, (1985) that is considering of germinated and sound un-germinated

Out of farmers who participated from kabati location of Kitui District, 90% of the ten farmers, managed to achieve germination. Among farmers from Chuluni location of Kitui District, a half of them got seeds germinating. In Kyanguthia location of Kitui District where there were three farmers participating in the experiment, only one managed to have results of germinating the seeds given. Table 1 show the percentages of farmers with seeds which had germinated.

**Table 2 Farmers who achieved germination in percentages**

| Location of famers | % of farmers germination |
|---|---|
| Kabati location | 90% |
| Chuluni location | 50% |
| Kyanguthia location | 30% |
| overall % | 56.70% |

**Figure 6 Pre-treated seeds and germinated**

In Chuluni location there were three famers who had been used to try the new method of germinating problematic seeds of *Melia volkensii.* Only one of them achieved germination of the seeds as shown in the figure 4.

 

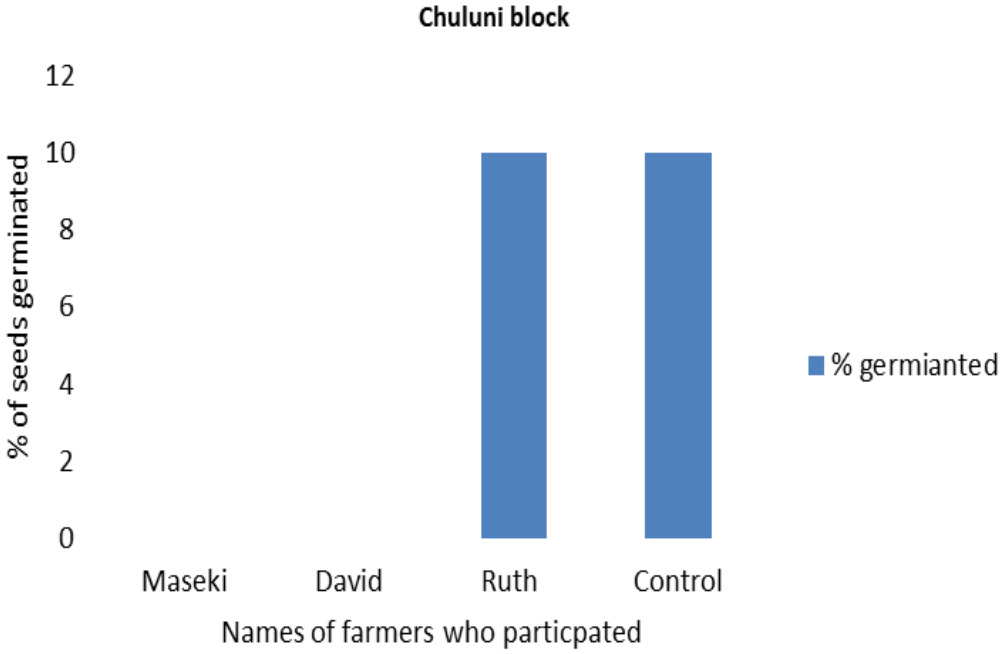


Figure 7 showing famers who participated and achievers of seed germination at Chuluni location as compared with control

Kyanguthia block had ten farmers, shown in figure 5, used in the experiment, only five managed to report germination of *Melia Volkensii* seeds.

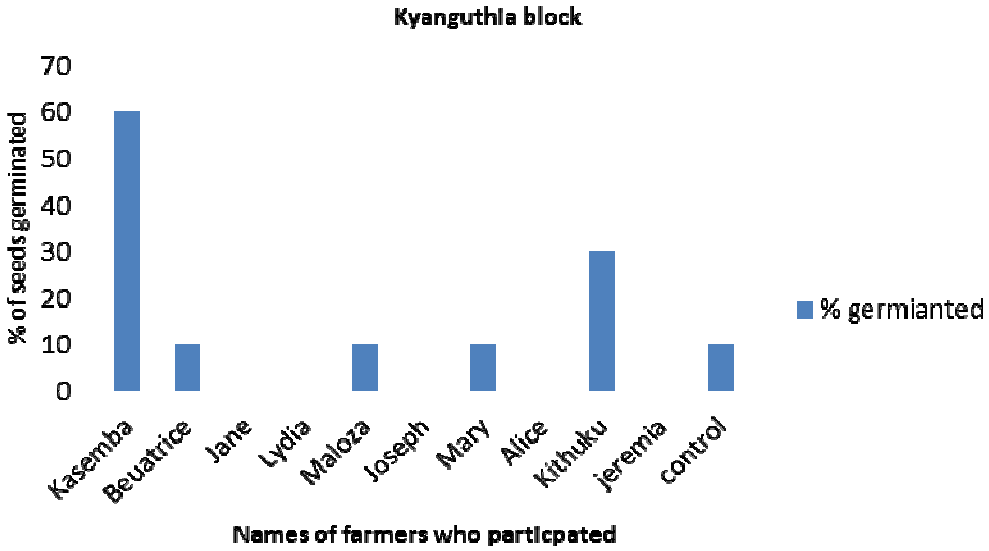


**Figure 8 showing famers who participated and achievers of seed germination at Kyanguthia location**

Kabati location had ten farmers in the experiment, were only one failed to have any germination of *Melia volkensii* seeds as figure 6 shows.

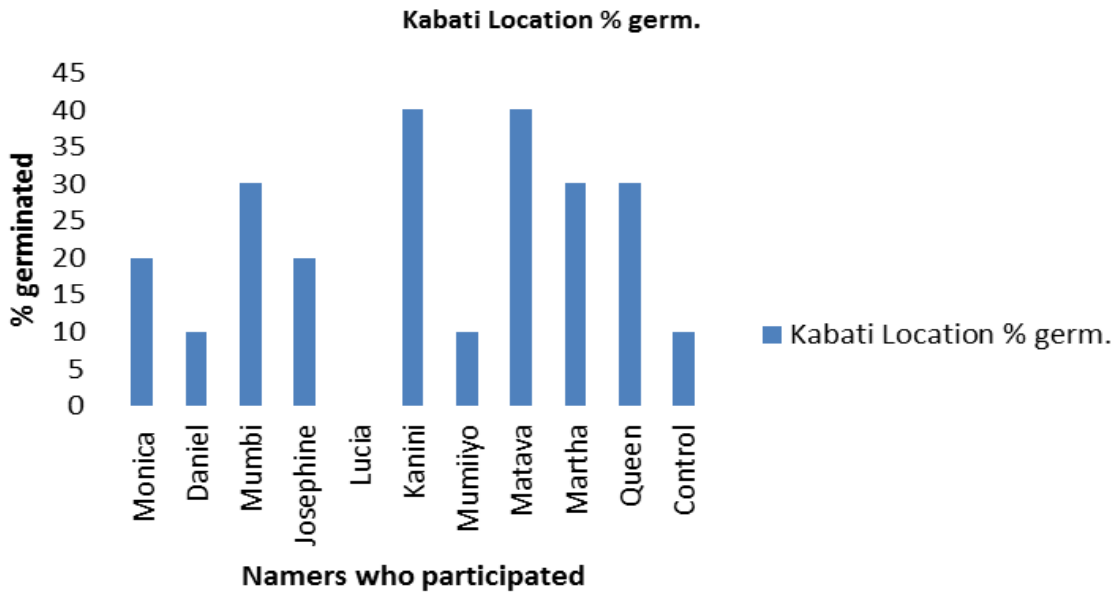


**Figure 9 showing famers who participated and achievers of seed germination at Kabati location**

These results were subjected to $\chi^2$ test to visualize if the germinations were significantly different from one block of farmers to the other while comparing with control experiment. The test also indicated non-germinated seeds if they differed from farmer to farmer or block to block and control.

**Table 2 Number of seed of *Melia volkensii* germinated and not-germinated as used for χ2 test**

| Blocks of farmers | No. germinated | | No. not germinated | | Total |
|---|---|---|---|---|---|
| | Occurrence | expected | Occurrence | expected | |
| Kabati | 16 | 11.2 | 84 | 88.8 | 100 |
| Chuluni | 1 | 3.36 | 29 | 26.64 | 30 |
| Kyanguthi | 10 | 12.32 | 100 | 97.68 | 110 |
| Control | 1 | 1.12 | 9 | | 10 |
| Total | 28 | | 222 | | 250 |

Value of χ2 test at 3 degree of freedom at $p<0.05$ is 7.824 which more than calculated χ2 which is 7.43 showing there is no significant difference in the seeds germinated/ not germinated, between farmers/control and blocks of farmers

## 8. Discussions on results

From the table two persons achieved higher germination because of the position placed the sachet of seeds. In general temperature in Kitui were not as expected because it is normally hot i.e. temperatures above $25^0$c to be high but were below $20^o$C which was quite low for germination of *Melia volkensii* due to prevailing rainy conditions experienced at time of the experiment.. This affected the germination significantly. The seeds which showed relatively good germination were kept inside the house one in the cupboard and the other one in plastic casing. Those positions had stable higher temperature favoring *Melia volkensii* seed germination. Most of other seeds sachets were placed kept in areas with fluctuating temperatures which eventually affected germination.

There might have been some setbacks in the project because of experience of pre-treatment crew may have influenced germinations negatively. The crews were not used to such new method of germinating *Melia volkensii*.

The experiment had a control at Tiva Station within Kitui district. The Tiva is situated twenty kilometers from Kitui town and used by KEFRI for production of tree seedlings. Since this is controlled by experienced employee of KEFRI it was ideal for control. The control experiment was sown directly on the tray with sand (normal practice) which gave 10% germination and no fungal attack was experienced. From data analysis it indicates that, farmer's seeds germinations were not significantly different between the farmers and control. This phenomena indicated the same seed quality and same per-treatment was used otherwise there could be fluctuations in results.

## 9. Conclusions

The experiment has shown that germination of *Melia Volkensii* with new method is possible by any farmer so long as the seeds are processed by experts and packaged as described above. This can also be used to other seeds difficult for laymen who need to germinate them.

Higher germination was achieved by farmers who kept the package inside the house in and areas with higher constant temperatures. The zero percentage germination was achieved by the farmers who had placed the package in areas with fluctuating temperatures

From the experiment the germination of *Melia volkensii* by the farmers Kitui is possible. The germination is best in constant warm temperature. Farmers are willing to have the germinating of this important tree of *Melia volkensii* done at their homes for purposes of tree planting and sale of products from the tree. This experiment had some limitation, that the right temperature was not attained due to prevailing cool rainy conditions.

## 10. Recommendation

The experiment has indicated that it is possible for farmers to germinate *Melia volkensii* seeds with this type of method. Since this was first undertaking, it has brought in limelight many other aspects which require further investigations.

1. Which type, gauge, color, of polythene paper or any other material could retain constantly higher temperature of 30$^{o}$C?

2. Which position of placing the sachet for best germination by the farmer?

3. The best season when the germination can be triggered (dry season or rainy season)?

4. Need to standardize pre-treatment protocol for all to adopt correctly?

5. Studies of how long a sachet with treated seeds can be stored.

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Kyuso Maarifa Center is one of ALIN centers and is located in Kyuso District. a District that is 60km from Mwingi town-Kenya. It Mission is to improve the delivery and utilization of useful information to the people of Kyuso and the surrounding through the application of modern technology. They Blog website visited on January 19, 2016.

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## 12. Acknowledgement

This work was made possible by the coordinator JICA who funded the work. There was also a lot of co-operation from the Centre Director Kitui who kindly allowed us to use staff and facilities at the Centre. Special thanks go to Mr. Kyalo, James, and Tito who availed seeds for the experiment. The extension staffs were also very useful in selecting farmers and helped in monitoring.

## 13. Appendix

Table 3 Results showing name of farmer and position the sachet kept**.**

### a. Kabati

| **Farmer** | **No. Germinated** | **No. Intact** | **No. attacked by fungi** | **% germinated** | **Place kept**<br><br>**Ranking** |
|---|---|---|---|---|---|
| Monica Nguli | 2 | 1 | 8 | 20 | Kept indoor |
| Daniel Munyoki | 1 | 1 | 9 | 10 | Kept indoor |
| Mumbi Mutunga | 3 | 2 | 7 | 30 | Kept indoor |
| Josphine Kyale | 2 | 2 | 8 | 20 | Kept indoor |
| Lucia Kiringa | 0 | - | 10 | 0 | Kept on a cupboard |
| Kanini Sammy | 4 | 4 | 6 | 40 | Kept in a cupboard |

 

| | | | | | |
|---|---|---|---|---|---|
| Mumiiyo Woman Group | 1 | 1 | 9 | 10 | Kept on a table |
| Matava Ndathya | 1 | 3 | 6 | 40 | Kept on a tree outside |
| Martha Kasaki | 1 | 2 | 7 | 30 | Kept on a tree |
| Queen Kivindwo | 1 | 3 | 6 | 40 | Kept on a tree |

**b. Chuluni**

| **Farmer** | **No. Germinated** | **No. Intact** | **No. attacked by fungi** | **% germinated** | **Place kept Ranking** |
|---|---|---|---|---|---|
| Maseki Wanyamo | 0 | - | 10 | 0 | Kept on a table |
| David Ngande | 0 | - | 10 | 0 | Kept on a table |
| Ruth Sammy | 1 | 1 | 9 | 10 | Kept on a table |

**c. Kyanguthia**

| **Farmer** | **No. Germinated** | **No. Intact** | **No. attacked by fungi** | **% germinated** | **Place kept Ranking** |
|---|---|---|---|---|---|
| Kasemba Munyoki | 6 | 2 | 8 | 60 | No mycelium but rotting noticed |
| Beatrice Mumo | 1 | 1 | 9 | 10 | Kept on a cupboard |
| Jane Nyamai | 0 | - | 10 | 0 | Kept on a cupboard |
| Lydia | 0 | - | 10 | 0 | Kept on a |

| | | | | | |
|---|---|---|---|---|---|
| Muaia | | | | | cupboard |
| Malonza Ngira | 1 | 1 | 9 | 10 | Kept on a cupboard |
| Joseph Juma | 0 | | | | Kept in a locked office not seen |
| Mary Vindya | 1 | 1 | 9 | 10 | kept on floor under a cupboard |
| Alice Masila | Not at home | | | | |
| Mary Kithikii | | | | | Not at home |
| Kilugia Kithuku | | 3 | 7 | 30 | Kept amongst clothes |
| Jeremia Nguniko | 1 | | | | no germination noticed |
| Tiva station control | 1 | 2 | 7 | 30 | outside on a tree |